ABSTRACT

An improved metal gas separation membrane for separating hydrogen from a gas steam includes a quantity of metal particles that are bonded together to form a porous body that is selectively permeable to hydrogen. The porous body may have a porosity that increases from a first surface to an opposite second surface. The metal gas separation membrane may additionally include a coating of ceramic particles on the first surface thereof to further decrease the porosity at the first surface. Alternatively, or in addition thereto, the metal gas separation membrane may include a thin foil or coating of a dense precious metal such as palladium, palladium-alloys, and the like applied thereto that is permeable by hydrogen according to a chemisorption-dissociation-diffusion transport phenomenon. Still alternatively, or in addition thereto, the porous body may include a catalytic enhancement that can interact with a gas stream to increase the concentration of hydrogen according to various catalytic reactions such as the water gas shift reaction and the ammonia decomposition reaction. The abstract shall not be used for interpreting the scope of the claims.